

# LONDON- WEST MIDLANDS ENVIRONMENTAL STATEMENT

## Volume 5 | Technical Appendices

CFA8 | The Chalfonts and Amersham

**Construction assessment (SV-003-008)**

Sound, noise and vibration

November 2013

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Department  
for Transport

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# 1 Introduction

- 1.1.1 The sound, noise and vibration appendices comprise four sections. The first of these is an introduction to the relevant route-wide methodology, assumptions and assessment (Volume 5: Appendix SV-001-000). This relates to the sound, noise and vibration assessment for all community forum areas (CFA).
- 1.1.2 For the Chalfonts and Amersham community forum area (CFA 8), the other three sections are as follows:
- baseline sound, noise and vibration (Volume 5: Appendix SV-002-008);
  - construction sound, noise and vibration (Volume 5: Appendix SV-003-008) (this appendix); and
  - operational sound, noise and vibration (Volume 5: Appendix SV-004-008).
- 1.1.3 The outcomes of the assessment are summarised in Volume 2: CFA Report 08, Chalfonts and Amersham (CFA Report 08), Section 11.
- 1.1.4 Maps referred to throughout the sound, noise and vibration appendices are contained in the Volume 5, Sound, Noise and Vibration Map Book.
- 1.1.5 This appendix presents the likely noise and vibration impacts, effects and significant effects arising from the construction of the Proposed Scheme for the Chalfonts and Amersham area on:
- people, primarily where they live ('residential receptors') in terms of:
    - individual dwellings;
    - on a wider community basis, including any shared community open areas; and
  - community facilities such as schools, hospitals, places of worship, and also commercial properties such as offices and hotels, collectively described as 'non-residential receptors' and 'quiet areas'.
- 1.1.6 The assessment of likely impacts, effects and significant effects from construction noise and vibration on agricultural, community, ecological or heritage receptors and the assessment of tranquillity are presented in the following documents within Volume 5:
- |                                   |                     |
|-----------------------------------|---------------------|
| • Agriculture, forestry and soils | Appendix AG-001-008 |
| • Community                       | Appendix CM-001-008 |
| • Ecology                         | Appendix EC-005-008 |
| • Heritage                        | Appendix CH-003-008 |
| • Landscape and Visual            | Appendix LV-001-008 |

## **1.2 Evaluation of impacts and effects**

- 1.2.1 This appendix provides a quantitative assessment of construction noise and vibration impacts/effects and a qualitative assessment of likely significant effects, based on the impacts/effects identified and other local context information consistent with the scope and methodology defined for the Proposed Scheme.
- 1.2.2 Indirect effects arising from temporary changes in traffic patterns on the existing road network as a consequence of constructing the Proposed Scheme are also reported in this appendix, where they will occur within the study area (as defined in Volume 5: Appendix SV-001-000).
- 1.2.3 In undertaking the assessment of sound and vibration, consistent with Environmental Impact Assessment (EIA) Regulations and emerging National Planning Practice Guidance<sup>1</sup> a differentiation between impacts effects, adverse effects and significant effects is made. Further information is provided in Volume 5: Appendix SV-001-000.
- 1.2.4 The assessment of impacts and effects has been undertaken at assessment locations that are representative of a number of dwellings or other sensitive receptors. The assessment locations employed in this assessment are presented in the SV-03 Map Series (Volume 5, Sound, Noise and Vibration Map Book).

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<sup>1</sup> Information is provided in the Department for Communities and Local Government's emerging National Planning Practice Guidance – Noise <http://planningguidance.planningportal.gov.uk>, (refer to the noise exposure hierarchy), as available on 14th October 2013.

## 2 Scope, assumptions and limitations

### 2.1 Regional and local policy guidance

2.1.1 The policy framework for sound, noise and vibration is set out in Volume 1 and in Volume 5: Appendix SV-001-000. As part of the engagement with local authorities through the Planning Forum Sub Group - Acoustics, information regarding any specific local planning guidance in respect of noise and vibration has been requested. Whilst no information has been received for this study area via the Planning Forum Sub Group - Acoustics, the following local policy guidance on noise and vibration has been identified:

- The Local Plan for Chiltern District, September 1997.

2.1.2 This guidance has been considered as part of formulating the detailed application of the impact and significance criteria set out in Volume 5: Appendix SV-001-000.

### 2.2 Engagement

2.2.1 Details of engagement on a route-wide basis with the local and county authorities' Environmental Health Practitioners via the Planning Forum Sub Group - Acoustics, is set out in Volume 1.

2.2.2 Engagement with communities has been via the Community Forums, as set out in Volume 1. In respect of sound, noise and vibration the following discussions have taken place:

- general discussions in respect of local issues, including possible ways to avoid and mitigate the potential impacts of noise or vibration;
- September / October 2012: a specific presentation about sound, noise and vibration with discussion afterwards with one of the project team specialists;
- November / December 2012: specific request for the Community Forum regarding baseline sound monitoring locations;
- January / February 2013: feedback to the Community Forum on any proposed baseline monitoring locations; and
- verbal / written responses to questions and sound, noise and vibration.

### 2.3 Methodology

2.3.1 The methodology used for the assessment of airborne sound, ground-borne sound and vibration impacts and the determination of significant effects is defined in the Scope and Methodology Report (SMR) (Volume 5: Appendix CT-001-000/1). Further clarification regarding specific areas is presented in the SMR addendum (Volume 5: Appendix CT-001-000/2). Further information is contained in Volume 5: Appendix SV-001-000.

## **2.4 Assumptions**

- 2.4.1 Route-wide assumptions are outlined in Volume 1 and are further detailed in Volume 5: Appendix SV-001-000. Local assumptions that apply to the assessment of construction sound noise and vibration within this area are set out in Volume 2: CFA Report 08.
- 2.4.2 Tunnel boring machines (TBM) will be used to excavate the tunnels. Materials (including tunnel lining segments), people and equipment will be transported from the surface to each TBM using small construction trains, which will travel at relatively low speeds. Excavated material from each TBM will be transported to the surface by conveyor. It has been assumed that significant noise and vibration effects arising from use of the temporary railway will be avoided through appropriate design and maintenance specification. Other methods material movement may be employed; however, these would result in lower ground-borne noise and vibration.

## **2.5 Limitations**

- 2.5.1 The route-wide limitations and the approach adopted to assure that they will not impact the robust assessment of sound, noise and vibration are presented in Volume 5: Appendix SV-001-000. No specific additional limitations are identified for this study area.



## **3 Environmental baseline**

### **3.1 Existing baseline**

- 3.1.1 Baseline sound level data has been collected at locations representative of the airborne sound-sensitive receptors. The existing and future baseline airborne sound levels derived from these measurements are given in Volume 5: Appendix SV-002-008. Details of the baseline data collection and the methodology are given in Volume 5: Appendix SV-001-000 and specifically for this study area in Volume 5: Appendix SV-002-008.

### **3.2 Future baseline**

- 3.2.1 The assessment of noise from construction activities assumes a baseline year of 2017 which represents the period immediately prior to the start of the construction period. As a reasonable worst case, it has been assumed that no change in baseline sound levels will occur between the existing baseline (2012/13) and the future baseline year of 2017. The assessment of noise from construction traffic assumes a baseline year of 2021, representative of the middle of the construction period when the construction traffic flows are expected to be at their peak. Further information can be found in the Traffic and Transport assessment (Volume 5: Appendix TR-001-000).

## **4 Effects arising during construction**

### **4.1 Introduction**

4.1.1 The assessment is reported first for ground-borne sound and vibration and then for airborne sound. Under each of these headings, the results of the quantitative identification of impacts and effects are presented. This is followed by the identification of significant effects and the evidence used to support these conclusions.

4.1.2 The structure of this assessment report is as follows:

- Avoidance and mitigation measures
- Quantitative identification of impact and effects
  - Ground-borne sound and vibration
    - residential
    - non-residential
  - Airborne sound
    - residential
    - non-residential
- Assessment of impacts and effects
  - residential receptors: direct effects – dwellings
  - residential receptors: direct effects – communities
  - residential receptors: indirect effects
  - non-residential receptors: direct effects
  - non-residential receptors: indirect effects
  - cumulative effects from the Proposed Scheme and other committed development

### **4.2 Avoidance and mitigation measures**

4.2.1 These measures are set out in Volume 2: CFA Report 08.

### **4.3 Quantitative identification of impacts and effects**

#### **Ground-borne sound and vibration**

4.3.1 TBMs will be used to excavate the tunnels. Each TBM is likely to generate ground-borne noise and vibration impacts but only at receptors within a close distance of the centre line of the tunnels and only for short periods of time (a few days).

Overall, the deeper the tunnel is, the lower the impact. The perceptible noise and vibration will increase as each TBM approaches and diminish as it moves away from the receptor. Vibration from TBM will present no risk of any building damage.

- 4.3.2 The effects of vibration from TBMs on building occupants will be short-term (a matter of days) and hence they are not considered to be significant. Proactive and advanced community relations in advance of each TBM passing under properties will help manage expectations and allay possible concerns over the short-term presence of vibration.
- 4.3.3 No impacts have been predicted as the result of ground-borne sound and vibration in this area.

### **Airborne sound: direct impacts and effects**

- 4.3.4 Activities associated with the construction phases of the Proposed Scheme will generate airborne noise. The assessment of the likely impacts and significant effects as a result of the construction noise has considered the effects on:
- residential receptors, both as individual dwellings and communities; and
  - non-residential receptors, including quiet areas.
- 4.3.5 Volume 2: CFA Report 08 makes reference to any major construction activity during the evening and at night but the assessment has also considered the minor essential activities that will have to operate on a 24/7 basis for reasons of safety and engineering practicability (e.g. water pumps)
- 4.3.6 For each type of receptor, subject to the screening distances identified, and based upon supplied plant information from engineers, the typical and highest monthly  $L_{pAeq,T}$  noise levels from construction activities have been calculated at the façade of all assessment locations, which are representative of a number of receptors in the study area.
- 4.3.7 The assessment results, impact criteria and significance criteria for the assessment of the scheme at residential and non-residential receptors are presented in Table 1 and Table 2 respectively.
- 4.3.8 The construction activity resulting in highest forecast noise levels is reported in Table 1 and Table 2 for each assessment location and time period, where the highest forecast noise level from any individual construction activity is above  $L_{pAeq,T}$  40dB during the daytime and evening periods and  $L_{pAeq,T}$  35dB during the night-time. Where the highest forecast noise level from any individual construction activity is less than  $L_{pAeq,T}$  40dB during the daytime and evening or  $L_{pAeq,T}$  35dB during the night-time no activities have been reported.

Explanation of the information within Table 1 and

4.3.9 Table 2 is provided in Volume 5: Appendix SV-001-000, with the following additional notes:

Where the significant effect column is highlighted, then a significant effect is identified at the referenced community, or individual non-residential receptor

- \* Significant effect – the quantitative impact methodology has identified either:
  - 1) no impact at this receptor but further information (see assessment) has identified that a significant effect is nonetheless likely; or
  - 2) an impact at this receptor which, based upon further qualitative receptor information, (see assessment text) does not give rise to a significant effect.
- ~ The forecast adverse effects are not considered to be significant on a community basis (further information on methodology is provided in Volume 5: Appendix SV-001-000).
- A Type of effect – adverse effect
- S Type of effect – significant adverse effect
- NA Type of effect – not generally an adverse effect
- B Type of effect – for non-residential receptors further detail about the type of effect is set out in the text of Appendix SV-001-000
- R Type of receptor - residential
- G Type of receptor:
  - (G1) theatres, large auditoria and concert halls;
  - (G2) sound recording and broadcast studios;
  - (G3) places of meeting for religious worship, courts, cinemas, lecture theatres, museums and small auditoria or halls;
  - (G4) schools, colleges, hospitals, hotels and libraries; or
  - (G5) offices and general commercial premises.
- T Receptor design – typical
- S Receptor design - special
- H Existing environment – high existing ambient noise levels: daytime level more than 75dB, evening-time level more than 65dB or night-time level more than 55dB  $L_{pAeq}$  at the façade.
- NI Mitigation effect - identified as likely to qualify for noise insulation under the draft Construction Code of Practice (draft CoCP).
- D,E,N Impact duration (months) – duration of impact during the day (D), evening (E) or night (N).

Table 1: Assessment of construction noise at residential receptors

Assessment location		Impact criteria				Significance criteria										Significant effect
ID	Area represented	Typical/highest monthly outdoor L <sub>pAeq</sub> [dB] at the façade			Construction activity resulting in highest forecast noise levels	Type of effect	Number of impacts represented	Type of receptor	Receptor design	Existing environment	Unique feature	Combined impact	Impact duration [months]	Mitigation effect		
		Day 0700-1900	Evening 1900-2300	Night 2300-0700												
392953	Chalfont Lane, West Hyde	55/59 [>C]	52/54 [>C]	52/54 [>C]	Day: Chiltern tunnel - south tunnel portal - construction works - superstructure; Evening: Chiltern tunnel - launch and drive tunnel (northbound tunnel); and Night: Chiltern tunnel - launch and drive tunnel (northbound tunnel).	NA	1	R	T	H	-	-	-	-		
394598	West Hyde Lane, Chalfont St. Peter	41/45 [B]	<40/40 [>C]	38/40 [>C]	Day: Chiltern tunnel - launch and drive tunnel (northbound tunnel); Evening: Chiltern tunnel - launch and drive tunnel (northbound tunnel); and Night: Chiltern tunnel - launch and drive tunnel (northbound tunnel).	NA	1	R	T	H	-	-	-	-		
394612	Roberts Lane, Chalfont St. Peter	43/46 [B]	40/43 [>C]	40/43 [>C]	Day: Chiltern tunnel - south approach cutting - cutting - excavation; Evening: Chiltern tunnel - launch and drive tunnel (southbound tunnel); and Night: Chiltern tunnel - launch and drive tunnel (southbound tunnel).	NA	1	R	T	H	-	-	-	-		
394900	Roberts Lane, Chalfont St. Peter	42/44 [B]	<40/42 [>C]	39/42 [>C]	Day: Chiltern tunnel - south approach cutting - cutting - excavation; Evening: Chiltern tunnel - launch and drive tunnel (southbound tunnel); and Night: Chiltern tunnel - launch and drive tunnel	NA	5	R	T	H	-	-	-	-		

Assessment location		Impact criteria				Significance criteria									Significant effect
ID	Area represented	Typical/highest monthly outdoor $L_{pAeq}$ [dB] at the façade			Construction activity resulting in highest forecast noise levels	Type of effect	Number of impacts represented	Type of receptor	Receptor design	Existing environment	Unique feature	Combined impact	Impact duration [months]	Mitigation effect	
		Day 0700-1900	Evening 1900-2300	Night 2300-0700											
					(southbound tunnel).										
395087	Shire Lane, Chalfont St Peter	42/45 [B]	<40/42 [>C]	39/42 [>C]	Day: Chiltern tunnel - south tunnel portal - construction works - superstructure; Evening: Chiltern tunnel - launch and drive tunnel (southbound tunnel); and Night: Chiltern tunnel - launch and drive tunnel (southbound tunnel).	NA	4	R	T	H	-	-	-	-	
700476	Chesham Lane, Chalfont St. Giles	52/55 [A]	<40/<40 [A]	<35/<35 [B]	Day: Chalfont St Peter tunnel ventilation and intervention shaft (vent shaft) - construct diaphragm panels.	NA	2	R	T	-	-	-	-	-	
700485	Whielden Heights, Amersham	43/45 [C]	<40/<40 [>C]	<35/<35 [>C]	Day: Amersham Tunnel Ventilation Shaft - Construct Diaphragm Panels	NA	6	R	T	H	-	-	-	-	
700486	Bottom House Lane, Chalfont St. Giles	59/62 [A]	<40/40 [A]	39/40 [A]	Day: Chalfont St Giles tunnel vent shaft - construct diaphragm panels; Evening: Chalfont St Giles tunnel vent shaft - construct diaphragm panels; and Night: Chalfont St Giles tunnel vent shaft - construct diaphragm panels.	NA	1	R	T	-	-	-	-	-	
700487	Bottom House Lane, Chalfont St. Giles	51/54 [A]	<40/<40 [A]	<35/<35 [A]	Day: Chalfont St Giles tunnel vent shaft - construct diaphragm panels.	NA	1	R	T	-	-	-	-	-	

Assessment location		Impact criteria				Significance criteria									Significant effect
ID	Area represented	Typical/highest monthly outdoor L <sub>pAeq</sub> [dB] at the façade			Construction activity resulting in highest forecast noise levels	Type of effect	Number of impacts represented	Type of receptor	Receptor design	Existing environment	Unique feature	Combined impact	Impact duration [months]	Mitigation effect	
		Day 0700-1900	Evening 1900-2300	Night 2300-0700											
700492	Chesham Lane, Chalfont St. Peter	59/62 [A]	<40/<40 [C]	38/39 [>C]	Day: Chalfont St Peter tunnel vent shaft - construct diaphragm panels; and Night: Chalfont St Peter tunnel vent shaft - construct diaphragm panels.	NA	2	R	T	H	-	-	-	-	

Table 2: Assessment of construction noise at non-residential receptors

Assessment location		Impact criteria				Significance criteria									
ID	Area represented	Typical/highest monthly outdoor L <sub>pAeq</sub> [dB] at the façade			Construction activity resulting in highest forecast noise levels	Type of effect	Number of impacts represented	Type of receptor	Receptor design	Existing environment	Unique feature	Combined impact	Impact duration [months]	Mitigation effect	
		Day 0700-1900	Evening 1900-2300	Night 2300-0700											
700488	Whielden Heights, Amersham	60/63	<40/40	39/40	Day: Amersham tunnel vent shaft - construct diaphragm panels; Evening: Amersham tunnel vent shaft - construct diaphragm panels; and Night: Amersham tunnel vent shaft - construct diaphragm panels.	B	1	G4	T	H	-	-	-	-	

## Airborne sound: indirect effects

- 4.3.10 Construction road traffic associated with the construction phases of the Proposed Scheme will generate airborne noise. The change in traffic noise level at a reference distance of 10m from the edge of the nearside carriageway resulting from the presence of construction traffic for a given road has been predicted, based upon traffic information for the Proposed Scheme. The results for the roads where potentially significant effects could arise are presented in Table 3.
- 4.3.11 Explanation of the information within Table 3 is provided in Volume 5: Appendix SV 001 000, with the following additional notes:



Where the significant effect column is highlighted in dark red, then a significant effect is identified on nearby communities or individual receptors

### Change values



Yellow denotes a minor impact – a change of between 3 and 5dB or between 1 and 3dB where a high existing sound level is identified



Orange denotes a moderate impact – a change of between 5 and 10dB or between 3 and 5dB where a high existing sound level is identified



Red denotes a major impact – a change of more than 10dB or more than 5dB where a high existing sound level is identified



Table 3: Assessment of construction traffic noise levels

Road name	Link	Future baseline sound level (dB)	Future baseline sound level + construction traffic (dB)	Change (dB)	Significant effect
		Daytime L <sub>pAeq,16hr</sub> 0700-23:00 free-field	Daytime L <sub>pAeq,16hr</sub> 0700-23:00 free-field		
New link between Chalfont Lane / Shire Lane and Hornhill Road	East of M25	0**	56.3	N/A**	
Bottom House Farm Lane	Passing through Chalfont St Giles	37.3	49.4	+12.1	
M25 clockwise J17 Offslip	M25 J17	68.0	69.9	+1.9	
M25 anticlockwise J17 Onslip	M25 J17	64.2	67.7	+3.5	

\*\* New link therefore no 2012 Basic Noise Level.

## 4.4 Assessment of significant effects

### Residential receptors: direct effects – individual dwellings

- 4.4.1 Taking account of the avoidance and mitigation measures, no residential buildings are forecast to experience noise levels higher than the noise insulation trigger levels as defined in the draft CoCP. For daytime construction the trigger level is an equivalent continuous noise level of 75dB<sup>2</sup>.
- 4.4.2 The mitigation measures will reduce noise inside all dwellings such that it does not reach a level where it would significantly affect<sup>1</sup> residents.

### Residential receptors: direct effects – communities

- 4.4.3 The avoidance and mitigation measures in this area will avoid airborne construction noise adverse effects<sup>1</sup> on the majority of receptors and communities. Residual temporary noise or vibration effects are identified later in this report.
- 4.4.4 Excavation and concrete pours for ventilation and intervention shaft (vent shaft) walls will need to be undertaken during the evening and night-time for reasons of safety, engineering practicability or to reduce the impact on existing transport. Further information is provided in Section 2.3 of Volume 2: CFA Report 08 (Chalfonts and Amersham) and in the draft CoCP.
- 4.4.5 The assessment takes into consideration the time of day that noise will be generated; noise at night is assessed against a more stringent criterion than in the evening; and in the evening against a more stringent criterion than during the day.
- 4.4.6 With regard to noise outside dwellings, the assessment of temporary effects takes account of construction noise relative to existing sound levels.
- 4.4.7 In locations with lower existing sound levels<sup>3</sup>, construction noise effects<sup>1</sup> are likely to be caused by changes to noise levels outside dwellings. These may be considered by the local community as an effect on the acoustic character of the area and hence be perceived as a change in the quality of life. These effects are considered to be significant when assessed on a community basis taking account of the local context<sup>3</sup>.
- 4.4.8 In this area, the mitigation measures reduce the effects of outdoor construction noise on the acoustic character around the local residential communities such that the effects are considered to be not significant.
- 4.4.9 Detailed information regarding landscape earth works was not available at the time of the quantitative assessment. Therefore a screening assessment of the noise arising from these works on non-residential receptors has been undertaken by determining the minimum distance from the works site boundary at which the onset of a construction noise impact would be expected. In accordance with the draft CoCP these effects will be subject to review as part of the Section 61<sup>4</sup> application process for

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<sup>2</sup> L<sub>pAeq,0800-1800</sub> measured outdoors at the building façade.

<sup>3</sup> Further information is provided in Volume 5: Appendix SV-001-000.

<sup>4</sup> Section 61 Agreement under the Control of Pollution Act, 1974 (c.40). London, Her Majesty's Stationery Office.

the construction works. The screening assessment used represents a worst case scenario. The assessment has resulted in identification of no likely significant effects on residential receptors.

### **Residential receptors: indirect effects**

- 4.4.10 Significant noise effects on residential receptors arising from construction traffic are unlikely to occur in this area.
- 4.4.11 Potentially significant changes in noise as a result construction traffic have been identified on Bottom House Farm Lane, however, based on the absolute level of noise expected as a result of these changes, significant effects are unlikely at residential receptors. Furthermore, the increase in outdoor noise levels of 12 dB is the predicted change in the traffic noise level only. Daytime baseline noise measurements made on Bottom House Farm Lane suggest existing ambient noise levels of 46 dB L<sub>Aeq</sub>. Taking account of the existing noise environment a reduced increase in outdoor noise levels is expected.
- 4.4.12 No sensitive receptors have been identified in the vicinity of the route where increased traffic noise levels are expected, on the following roads:
- New link between Chalfont Lane / Shire Lane and Hornhill Road (East of M25) new road diversion;
  - M25 clockwise J17 off-slip (M25 J17); and
  - M25 anticlockwise J17 on-slip (M25 J17).

### **Non-residential receptors: direct effects**

- 4.4.13 Significant construction noise or vibration effects on non-residential receptors are unlikely to occur in this area

### **Non-residential receptors: indirect effects**

- 4.4.14 No sensitive receptors have been identified in the vicinity of the route where increased traffic noise levels are expected. Therefore significant noise effects on non-residential receptors arising from construction traffic are unlikely to occur in this area.

### **Cumulative effects from the Proposed Scheme and other committed development**

- 4.4.15 This assessment has considered the potential cumulative construction noise effects of the Proposed Scheme and other committed developments<sup>5</sup>. In this area, there is no development that would be likely to result in any significant cumulative construction noise and vibration effects.

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<sup>5</sup> Refer to Volume 5: Appendix CT-004-000

## 5 References

Control of Pollution Act 1974 (c.40). London, Her Majesty's Stationery Office.